PURPOSE & INTENT

Sec. 19-241 addresses the design criteria for all permanent stormwater management (water quantity) and Best Management Practice (water quality) basins. While this section outlines safety criteria for people that may be around the basin as a part of the basin design, this section does not outline the County's growing concern for the aesthetics of these basins. However, after a brief explanation of the safety criteria, we list suggestions that you should consider if your basin is visible to the public.

The safety criteria is designed to help prevent anyone from falling into the basin, or if they do, they are able to get out. Prior to the safety criteria becoming a part of the ordinance, basins were not regulated as to accessibility and steepness of side slopes. It was recognized that these steep-sloped, accessible basins could pose a hazard, especially to children who like to play around them. The safety criteria for small basins (average 4 foot depth and no more than an acre in size) is to have a safety bench around the basin or a fence. Large basins (more than 4 feet deep or greater than one acre in size) shall have a safety bench and an aquatic bench around the basin or a fence. The Director of Engineering may, at his discretion,

require a fence if the basin is within 100 feet a dwelling unit, school, child care center, playground, shopping center, library, hospital, public institution, pedestrian way or similar facility.

A safety bench is a relatively flat area (no greater than 10:1 slope) located at the toe of a slope just above the normal water elevation. An aquatic bench is a minimum six foot wide bench with a maximum depth of 12 inches below the normal water surface elevation that is installed around the outside perimeter of the pond. A fence shall be six feet high or it may also be a dense vegetative barrier at the time of installation.

One other safety criteria applies whenever the pond is located in an R, R-TH, or R-MF district or upon any other property used for residential purposes, schools, child care centers, playgrounds, or within 100 feet of the above uses and any pedestrian access ways (sidewalks, bicycle paths, walkways). In any of these situations, the pond shall be separated from such uses by a minimum of a fifty (50) foot vegetative perimeter yard measured from the 100 year water surface elevation or the downstream toe of the dam, whichever applies.

APPLICATIONS

When designing basins that will be visible to the public, we will look to you for how they can be made attractive, or at the very least, how you can limit their visibility.

WET BASINS: If the drainage area coming to the basin can include a large enough area, wet basins or ponds are typically most attractive (see photograph below with fountains often being added to maximize their appeal. If a fence is required, a decorative tubular steel or similar fence is strongly preferred over a chain link fence. Adding trees such as Weeping Willow or Bald Cypress can help soften the edges of the fenced pond and create a backdrop for a fountain.

Wet basins are the most effective method to remove pollutants to meet Chesapeake Bay requirements.

AQUATIC BASINS: Aquatic basins are often used when the basin is required for both Chesapeake Bay pollutant removal and stormwater management. While not as effective at removing pollutants as a wet pond, an aquatic basin with wetland plantings does remove pollutants while providing greater storage capacity for stormwater management. Aesthetically, aquatic basins can be visually unappealing if trash and debris is not removed or the design is box-shaped without appearing as a natural wetlands area. By using a curvilinear basin form that blends into existing land forms and appears to fit naturally on the site, the aquatic basin can be made to appear more as a natural wetland area than a rectangular man-made depression.



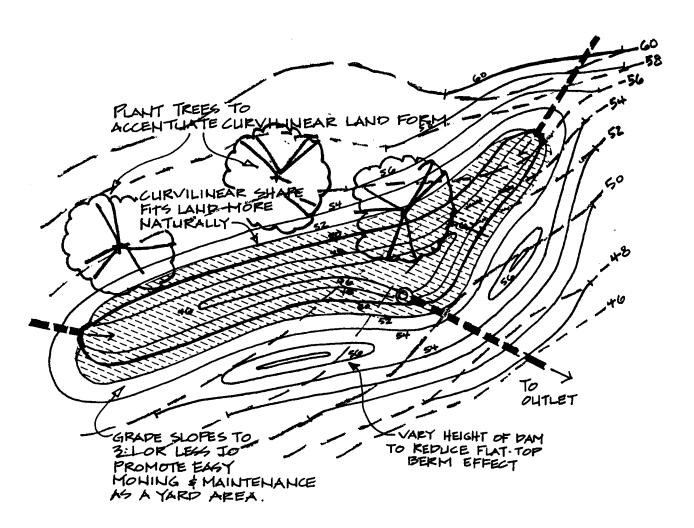
Shown above is a wet pond (BMP) at Chesterfield Marketplace Shopping Center that becomes a water feature with an attractive tubular steel fence around it.

APPLICATIONS (continued)

DRY BASINS: As with aquatic basins, dry basins tend to be trash collectors, especially if fenced. Whenever possible, we will look to you to design the dry basin using curvilinear land forms without steep slopes to make the basin depression appear as a natural land form that becomes more of a yard than any appearance of a hard, rectangular basin. When designed in a manner that allows for regular mowing, cleanup of debris and general maintenance is done on a more regular basis.

Dry basins often need to be located in setbacks that have their own landscaping requirement to be fulfilled. Environmental Enginneering does allow landscaping within the basins, using the list of plants that they accept. See pages 12-c.1 through 12-c.5.

If the site dictates that a basin must be designed in a hard, rectangular fashion with steep side slopes, then landscaping should be applied that limits the view of the basin from the public view.



Shown above is an example of using curvilinear land forms, mowable slopes, and landscaping to make a dry basin fit more into the natural landscape.

Below is the list of plant materials that the Environmental Engineering Department will allow within a basin, provided no plant materials are planted close to the center flow line of water through the basin.

| Mois Regi | ture | | | Tole | rance | | | Morp | hology | | General Characteristics | |
|--|--|-------------------|--|--|--|--|--|---|--|--|---|---|
| Indicator Status | Habitat | Ponding (days) | Sell | ON/ Grease | Metals | insects Disease | Exposure | Form | Height | Root System | Native | |
| FAC | Mesic | 2-4 | Ξ | Ξ | Ξ | E | Sun to partial sun | Oval shrub | ģ | Shallow | • | |
| FAC | Mesic | 2-4 | н | H | Ŧ | 2 | Sun | Rounded, broad dense strub | 5.7: | Shallow | | - 1 |
| FAC | Mesic to wet Mesic | 2.4 | . # | • | • | I | Sun to partial sun | Ovold shrub | 6-12' | Shallow | ۲. | |
| FACW | Mesic - Hydric | 24 | Ξ | I | Ξ | E | Sun or shade | Arching, spreading shrub | B -10° | Shellow | ۲. | - 1 |
| FAC | Mesic | 1:2 | Ξ | Ξ | I | E | Sun or shade | Flat, dense horizontal branching shrub | 8-7' | Shallow | |] |
| FAC | Mesic | 1.2 | Z | s | E | E | Sun to parilal sun | Upright dense ovel shrub | 10-12' | Shellow | • | |
| FAC | Mesic | 2-4 | Z. | 3 | Z | E | Sun or shade | Vase-like compact shrub | ģ | Shellow | ¥04 | |
| FAG | Mesia | 2.4 | Ξ | Z | Z | I | 8un | Ovold shrub | . 36 | Shallow | ٧. | |
| FACW . | Mesia to wet Mesia | 2.4 | H | н | • | I | Sun to pertial sun | Upright dense shrub | 6-12" | Shallow | Y 0.8 | |
| FACW | Mesic Mesic | 2:4 | ١ | Z | | I | Sun to partial sun | Spreading shrub | 6-12' | Shellow | . * | 1 |
| FAC | Dry Mesic - Mesic | 1.2 | 3 | = | π | M· H | Sun | Mounded shrub | 9. | Deep taproot | · | |
| | | | | | - | | | | | | | |
| Regime Regime Regime Regime FAC Regime FAC Resident Reside | Mois Regi Indicator Status FAC | | Sture gime Habitat Habitat Mesic Mesic Hydric Hyd | Sture gime Flablat Ponding Habitat (days) Mesic 2-4 Mesic 2-4 Mesic 2-4 Hydric 1-2 Mesic 1-2 Mesic 2-4 Mesic 2-4 | Sture gime Habhat Ponding Sell C Mesic 2-4 H Mesic 2-4 H Mesic 2-4 H Mesic 1-2 H Mesic 1-2 H Mesic 2-4 H Ito wei 1-2 H Mesic 2-4 H | Isture Isture Fording Idablat Idabl | Isture Folime Fieldhat Fonding Fonding Formatic All Ponding Formatic Fonding Formatic Formatic | Sture Tolerance Folding Salt City City | Sture Form Form | Sture Forming Salt City Mataba Insects Exposure Form Market City Salt City Mataba Insects Exposure Form Market City Salt City H H H M San to Ovel shrub Ovel shru | Sture Forming Salt CMy Matalas Insects Exposure Form Height Cdays) Salt Cdays Cdays | Sture Forming Sail Cores. Medical Exposure Form Height Root Spress Morphology |

Facultative - Equally likely to occur in wetlands or non-wetlands.
Facultative Upland - Usually occur in non-wetlands, but occasionally found in wetlands.
Facultative Wetland - Usually occur in wetlands, but occasionally found in non-wetlands.

| TABLE 3.1 RECOMMENDED PLANT SPECIES FOR USE IN BIORE Species Moisture Tolerance Regime | OMMEND Moisture Regime | NDED ure | PLANT | SP | | IES FOR | R USE | IN BIC | 3 2 | HON - | TION SHRUB SPECIES orphology General Characteristic | JB SP G Char | SPECIES General Characteristics | ic S |
|---|--------------------------|---------------------------------|-------------------|------|---------------|---------|--------------------|--------------------------|----------------------------------|---------------|---|--------------------|----------------------------------|----------|
| Scientific Name Common Name | Indicator Status | Hebitet | Ponding (daya) | Self | ON/ Grease | Molek | insects Disease | Еировиге | Form | Height | Root System | Native | Non- native : | Wildille |
| Juniparus hardsentatis "Bar Harbor" creeping juniper | FAC | Dry Mesic - Mesic | 1.2 | . 2 | I | Ξ | H-W | Swn | Matted shrub | 0.31 | Deep | | ٧., | High |
| Unders bearola spicetush | FACW | Mesic to wet Mesic | 2-4 | Н | • | · | В | 8un | qnays sqibida | 6-12* | Deep | . | ٠ | Hg. |
| Myrika pomoyivanka baybarry | FAC | Mesic | 7 | I | 8 | ĸ | н | Sun to partial sun | Rounded, compacted shrub | 6-6 | Shallow | ∀ | • | H. |
| Physoceraus epudfolius ninebark | FAC | Dry Mesic to wel Mesic | 2.4 | Z | • | • | = | Sun | Upright shrub | 6-12' | Shallow | , Yea | • | Med. |
| Viburum cashoides northern wild reisin | FACW | Mesic | 2 | Ξ | Ξ | H | Ξ | Sun to partial sun | Rounded, compacted shrub | ·0-0 | Shallow | Y •• | • | H 9 |
| Vibunum denistum errow-wood | FAC | Mesic | 2-4 | I | Ξ | . # | x | Sun to perite! sun | Upright, multi- stemmed shrub | 0 -10° | Shallow | ٧. | • | H95 |
| Vibunum beriege nannyberry | FAC | Mesia | 2-4 | н | Н | н | I | Sun to partial aun | Upright, multi- stemmed shrub | e-10° | Shallow | ۲ 08 | • | High |

| | | | | | | ; • | n wetland: on-wetland | ly found ir bund in no | ande. casional onally fo | or non-welli nde, but occ , but occasi | n wellands non-wellar n wellands, | ely to occur in ually occur in sually occur is | Facultative - Equally likely to occur in wetlands or non-wetlands. Facultative Upland - Usually occur in non-wetlands, but occasionally found in wetlands. Facultative Wetland - Usually occur in wetlands, but occasionally found in non-wetlands. | FACU FACW |
|----------------------------|-----|-----------------|----------------|-------------------------------|--------------------------|--------------------|--------------------------|---------------------------|--------------------------------|--|---|--|---|--------------|
| | | | | | | | | | | | | | High Tolerance Medium Tolerance Low Tolerance | ΓZI |
| • | l i | Shellow | 6 0-70° | Dense shade tree | Sun | Ξ | · | z | 3 | ž | M edo | FACU | Zelteva serrete Japanesa zeltova | der |
| • | 1 | Shallow | 80-75' | Dense single stem tree | Sun to partial sun | Ξ | 3 | Σ | | 7 | Mesic to wel Mesic | FACW | Thuje occidentalls arborvitae | arb. |
| Yee | | Shallow | 75. 100' | Typically single stem tree | Sun to parilat sun | Ξ | 2 | | | | Mesic - Hydric | FACW | Texedium distictium bold cyprese | Texes |
| ٠ | | Shellow | 40-70' | Shade tree | Sun | E | | 3 | Z | 1.2 | Mesic | FAC | Sophore Japanice Japanese pagoda tres | Soph |
| ٧. | | Shallow | 30:50 | Typically tall and slender | Ses | 8 | * | 3 | Ξ | 2.4 | Mesic - Xeric | FAC | Robink pseudo-scacla black locust | blec |
| No | | Deep teproot | 60-80' | Large spreading tree | Sun to partial sun | 2 | = | = | Ξ | 2:4 | Mesic | FAC | Quercus shumardii Shumard's red oak | Shu |
| Native | | Root System | Height | Form | Exposure | insects Disease | Metale | ON/ Grease | Salt | Ponding (days) | Hebitet | Indicator Stalus | Schaille Name Common Name | Com |
| General Characteristics | I | | Morphology | Morp | | | Tolerance | Tole | | | me | Moisture Regime | Species | Sp |
| E SPECIES | | - TREE | | DRETENTION | IN BIC | { USE | FOR | ECIE: | SP | PLAN | NDED | OMMEN | TABLE 3.1 RECOMMENDED PLANT SPECIES FOR USE IN BIORET | |
| | | | | | | | | | | | | | | |

PLANT MATERIALS(continued)

| <u> </u> | r z I | <u> </u> | | | - | | | | | r. | LAIN | 1 101 | АІС | KIA | LS(cc | mumu |
|---|---|-------------------------------|-------------------------------------|--|---|---|----------------------------------|-----------------------------------|----------------------------------|---------------------------------|-----------------------------|------------------------------------|------------------------------|--------------------------------|---------------------------|--|
| FAC Facultative - Equalty likely to occur in wellands or non-wellands. FACU Facultative Upland - Usually occur in non-wellands, but occasionally found in non-wellands. FACW Facultative Welland - Usually occur in wellands, but occasionally found in non-wellands. | High Tolerance Medium Tolerance Low Tolerance | Myssa sylvetka black gum | Uquidomber styreellibe sweet gum | Kockeuterle penkeulete golden-rain tree | Junipenus virginiane eastern red Geder | Obdisia triacanthos honeylocust | Giatgo bilobe Meldenhali tree | Frexhus pennsylvenke green ash | Frazious emericane vinite ash | Bende populifolie Gray birch | Betule algre river birch | Amelanchlor canadensis shadbush | Acer rubrum red mapla | Scientific Name Common Name | Species | LE 3.1 |
| bly to occur in ually occur in sually occur i | | FACW | FAC | FACU . | FACU | FAC | FAC | FACW | FAC | FAC | FACW | FAC | FAC | Indicator Status | Moisture Regime | OMME |
| n wellands non-wellar n wellands | | Mesic - Hydric | Mesic | Mesic | Mesia - Xeria | Mesi | Mesic | Mesic | Mesic | Xeric - Hydric | Mesic - Hydrio | Mesic | Mesic - Hydric | Hebitat | me | NDED |
| or non-wette nds, but oco , but ocoasic | į | 4 | • | 7 | 2 | 2 | 2.4 | 1.6 | 2.4 | 1.6 | 1.6 | 2.4 | 4.6 | Ponding (days) | | PLANT |
| ande. asionali onally to | | Ξ | Ξ | Ξ | Ŧ | I | Ξ | 3 | 2 | = | | = | = | Sell | | [SP |
| y found in und in no | | Ξ | Ξ | = | Ξ | Z | Ξ | = | I | Ξ | 3 | 2 | = | OH/ Grease | Tole | ECIE |
| wellande n-welland | | H | Ξ | Ŧ | | · | Ξ | Ξ | Ξ | E | 3 | | Ξ | Metals | Tolerance | S FOF |
| • | | = | 2 | 2 | I | 3 | Ξ | Ξ | I | Ξ | Ξ | Ξ | Ξ | Insects Disease | | { USE |
| | | Sun | Sun | 8un | 8 m | S | Sus | Partial Sun | Sun | Partial Sun | Partiel Sun | Partial Sun | Partiel Sun | Енровиге | | IN BIC |
| | | Large tree | Large tree | Round, dense shade tree | Dense single stem tree | Small canopled large tree | Large Iree | Large tree | Large tree | Single to multi-stem tree | Single to multi-stem tree | Single to multi-stem tree | Single to multi-stem tree | Form | Morp | RECOMMENDED PLANT SPECIES FOR USE IN BIORETENTION TREE |
| | | 40-70' | 50-70' | 20-30 | 50-75' | 50-78' | 50-80 | 40-65* | 50-80' | 35-50 | 80-75' | 35-50 | 50-70* | Height | Morphology | ON |
| X r e | | Shellow to deep teproot | Deep teproot | Shallow | Teproot | Shellow to deep veriable teproot | Shallow to deep | Shellow to deep | Deep | Shallow to deep | Shellow | Shallow | Shallow | Root System | | - TREE |
| | | , * | ٧• | • | ٧•• | Yee | • | Yes | •• • | • | Yee | Y 88 | Yes | Native | Cha | |
| | | • | • | Yes | ٠ | • | ٧ | • | • | ٧. | • | • | ٠ | Non- netive | General . Characteristics | SPECIES |
| | | ндн | High | No | Very High | Low | Low | Low | Low | High | High | Hgh | High | Wildlife | tics . | S |

| Mois Regi | ture me | | | Tole | rance | | | Morp | hology | | Char | eneral | |
|---------------------|--|-------------------|--|---|--|--|--|-------------------------------|--|--|--|---|----------|
| Indicator | Habita | Pondino | î | 2 | | | , | | | | | | 186 |
| Indicator Status | Habitat | Ponding (days) | Salt | Ol/ Grease | Motale | Insecte Disease | Exposure | Form | Height | Root System | Native | Non- | Wildlife |
| FACW | Mesic | N) | = | • | • | E | Sun | eess edsery | 70-80' | Shallow | · | ۲. | Low |
| FACW | Mesic - tiydric | 46 | Z | 2 | 3 | E | Sun | Large tree | 70-80' | Shallow | * | • | Med |
| FAC | Xeric - Mesic | ò | I | I | I | - | Sun | Large tree with apreading | 75. | Shallow | ¥. | • | Ē |
| FAC | Mesic | 2-4 | Ξ | Ξ | Ξ | I | Sun | Dense shade tree | 30-50* | Shallow to deep | | * | Low |
| FACW | Mesic to wet Mesic | 4.0 | # | • | I | Ξ | Sun to pertial | Large tree | 75· | Shallow | * | · | 표를 |
| FAC | Mesic | . 1-2 | Ξ | 3 | 3 | E | Sun | Large tree | 50-75' | Shellow to deep | * | · | 重 |
| FAC | Mesic to wet Mesic | 2-4 | н | Ξ | I | 2 | Sun . | Large spreading tree | 75- | Teproot | • | . ¥ | ŦĠ. |
| FACW | Meeta - Hydria | â | Ξ | Ξ | Ξ | 2 | Sun | Large tree | 60-80' | Shellow to deep teproot | * | • | 曼 |
| FACW · | Mesic Mesic | | Ξ. | | | Ξ | 8un | Large tree | 55-75* | Shallow | * | ٠ | H. |
| FAC | Mesic | 2-4 | S | H | 2 | 2 | Sun to partial sun | Large spreading tree | 60-60 | Deep | . * | _ · | ğ |
| | | | | | | | | | | | | | |
| | Mois Regi Indicator Status FACW FACW FACW FACW FACW FACW FACW FACW | | Sture gime Habitet Habitet Mesic Mesic | Sture Sture Sime Habhat Habhat Ponding (days) Mesic 2-4 Hydric Mesic Mesic Mesic 1-2 Mesic Mesic 1-2 Mesic Mesic 1-2 Mesic A-8 Hydric Mesic 2-4 Mesic 2-4 Mesic 2-4 Mesic 2-4 Mesic 2-4 Mesic 2-4 | Siture Siture Siture Habital Ponding Salt Carlo (days) Masic 2-4 H Masic 4-8 H In Wesic 4-8 H In Wesic 4-8 H Masic 1-2 H Masic | Itablest Ponding Salk OW (days) Salk OW Greese Mestic 2-4 III Mestic 4-8 M M M M Mestic 4-8 H H H Mestic 1-2 H H H Mestic 1-2 H M H Mestic 1-2 H Mestic 1-2 H M M H M Mestic 1-2 H M M M H M Mestic 1-2 H M M M M M M M M M M M M M M M M M M | Isture Isture Itabhat Itabh | Sture Tolerance Tolerance | Sture Forming Salt OW Metale Disease Exposure Form Metale Cayys) Salt M. M. M. M. Sun Large tree Metale A-8 H. H. H. H. H. H. Sun Large tree Metale A-8 H. H. H. H. H. H. Sun Dense shad Metale Cayys H. H. H. H. H. M. M. Sun Large tree Metale A-8 H. H. H. H. H. M. Sun Large tree Metale A-8 H. H. H. H. M. Sun Large tree Metale A-8 H. H. H. H. M. Sun Large tree Metale A-8 H. H. H. H. M. Sun Large tree Metale A-8 H. H. H. M. M. Sun Large tree Metale A-8 H. H. H. M. M. Sun Large tree Metale A-8 H. H. H. M. M. Sun Large tree Metale A-8 H. H. H. M. M. Sun Large tree Metale A-8 H. H. H. M. M. Sun Large tree Metale A-8 H. H. H. M. M. Sun Large tree Metale A-8 H. H. H. M. M. Sun Large tree Metale A-8 H. H. H. M. M. Sun Large tree Metale A-8 H. H. H. M. M. Sun Large tree Metale A-8 H. H. M. M. M. Sun Large tree Metale A-8 H. H. M. M. M. Sun Large tree Metale A-8 H. H. M. M. M. Sun Large tree Metale A-8 H. H. M. M. M. Sun Large tree Metale A-8 H. H. M. M. M. Sun Large tree Metale A-8 H. H. M. M. M. Sun Large tree Metale A-8 H. H. M. M. M. Sun Large tree Metale A-8 H. H. M. M. M. Sun Large tree Metale A-8 H. H. M. M. M. M. Sun Large tree Metale A-8 H. H. M. M. M. M. Sun Large tree Metale A-8 H. H. M. M. M. M. Sun Large tree Metale A-8 H. H. M. M. M. M. M. Sun Large tree Metale A-8 H. H. M. M. M. M. M. Sun Large tree Metale A-8 H. M. M. M. M. M. M. M. Sun Large tree Metale Metale Metale M. | Habited. Ponding Salt OW Messes Inaccis Exposure Form Masici: 4-8 M M M M Sun Large tree Hydric 4-8 H H H H H Sun Desireding Messic 4-8 H H H H H Sun Desireding Messic 4-8 H H H H H Sun Desireding Messic 4-8 H H H H H Sun Desireding Messic 4-8 H H H H H Sun Desireding Messic 4-8 H H H H M M Sun Large tree tree tree in the second Messic 4-8 H H H H H M Sun Large tree tree tree in Messic 4-8 H H H H M Sun Large tree tree in the second Messic 4-8 H H H H M Sun Large tree tree in the second Messic 4-8 H H H H M Sun Large tree tree in the second Messic 4-8 H H H H M Sun Large tree in the second Messic 4-8 H H H M Sun Large tree in the second Messic 4-8 H H H M Sun Large tree in the second Messic 4-8 H H H M Sun Large tree in the second Messic 4-8 H H H M Sun Large tree in the second Messic 4-8 H H H M M Sun Large tree in the second Messic 4-8 H H H M M Sun Large tree in the second Messic 4-8 H H M M Sun Large tree in the second Messic 4-8 H M H M M Sun Large tree in the second Messic 4-8 H M H M M Sun Large tree in the second Messic 4-8 H M M M Sun Large tree in the second Messic 4-8 M M M M Sun Large tree in the second Messic 4-8 M M M M Sun Large tree in the second Messic 4-8 M M M M Sun Large tree in the second Messic 4-8 M M M M Sun Large tree in the second Messic 4-8 M M M M Sun Large tree in the second Messic 4-8 M M M M Sun Large tree in the second Messic 4-8 M M M M Sun Large tree in the second Messic 4-8 M M M M Sun Large tree in the second Messic 4-8 M M M M M Sun Large tree in the second Messic 4-8 M M M M M M Sun Large tree in the second Messic 4-8 M M M M M M M Sun Large tree in the second Messic 4-8 M M M M M M M M M M M M M M M M M M M | Sture Tolerance Tolerance Morphology Hisbitat Ponding Salt Oly Merick Insects Exposure Form Helpht Medic 2-4 H M M M Sun Large tree 70-80° Hydric 4-8 M M M M Sun Large tree 70-80° Hydric 4-8 H H H Sun Large tree 70-80° Hydric 4-8 H H H Sun Large tree 70-80° Hydric 4-8 H H H Sun Dente shade 30-30° Helpht 100° | Stutre Form Haght Shallow Y Hadde Hage tree Haght Shallow Y Haght Hadde Hage tree Haght Hadde Haght Haght Hadde Haght Haght | Sture |

Design Standards Manual

Chesterfield County, Virginia